

REMARKS

Claims 1 through 8 continue to be in the case. New claim 9 is being submitted. New claim 9 is based on the language of claim 2.

Claims 1 and 2 are being amended

The Office Action refers to Election/Restrictions.

Restriction to one of the following inventions is required under 35 U.S.C. 121:

- I. Claim 1, drawn to product (by process), classified in class 428, subclass 149.
- II. Claim 2-8, drawn to method, classified in class 216, subclass 41.

The inventions are distinct, each from the other because of the following reasons:

Inventions II and I are related as process of making and product made. The inventions are distinct if either or both of the following can be shown: (1) that the process as claimed can be used to make another and materially different product or (2) that the product as claimed can be made by another and materially different process (MPEP § 806.05(f)). In the instant case the product as claimed can be made by another and materially different process such as one that involves wet etching (as opposed to plasma).

Claims 1 and 2 have been amended by reciting specifically plasma etching. The positive etched profiles with defined slope angle in silicon substrates are not obtainable by wet etching.

The plasma etching can be performed in a plasma etching plant according to the German printed patent document DE 42 41 045 C1 and the associated plasma etching plant. A disadvantage of the plasma etching method recited in German printed patent document DE 42 42 045 C1 with anisotropic plasma etching (depth) comprises that there can be obtained only nearly vertical etching profile walls are reachable having a slope angle of only nearly 90° . Inclined, beveled slope angles far below from 90° cannot be obtained with that method.

The present invention method refers to the method of German printed patent document DE 42 41 045 C1 and substantially improves thereon, wherein the present invention method with the recited features and steps in the claims 1 and 2 allows to adjust and etch a defined slope angle between 60° and 88° . The applicant estimates that this furnishes both a new silicon substrate as well as also a new method for a production of a silicon substrate, which both can be coordinated to a plasma etching plant.

Chemical wet methods are listed only historically, only for purposes of information, and do not play a present day role, but they are listed in the state of the art, since the wet methods perform an etching aligned only with reference to crystal planes.

Viewed on a time scale, initially the silicon substrates were etched only by wet chemical methods. For this purpose there can for example be employed mixtures of nitric acid (HNO_3), fluoric acid (HF), and water. The etching process runs in this case completely isotropically, i. E. the mask under etching is approximately as large as the etching depth. Limits for the application of the wet method result from the continuing minimization of the lateral structural dimensions, which follow from the requirement of increasing minimization of device elements of micro system technology.

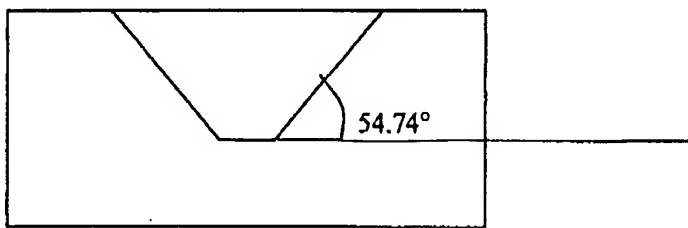
An aniso-tropic wet chemical structuring of silicon is possible by employing direction preferring alkaline etching solutions such as potassium hydroxide, lithium hydroxide or sodium hydroxide. The aniso-tropic character of the wet etching is based on the different dissolution speeds of the silicon in different crystal planes. The $\langle 111 \rangle$ -plane is slowest in being carried off and therefore operates as a structural limitation.

During etching of <100>-silicon there thus result frustro pyramidal like recesses, where the <111>-faces form the structural walls at a defined angle of 54.74° . At a structural width B_M in the etching mask a maximum etching depth A_t

$$A_t = \frac{B_M}{\sqrt{2}}$$

can be obtained. The reachable etching depth A_t is therefore limited and depends on the lateral dimensions of the structures. Since the position of the crystal planes according to angle and grid is fixed, the realization possibilities for micro structures with respect to a lateral shape and cross sectional shape of the etched ditches are very much limited.

About the following is given for a (100)-material:

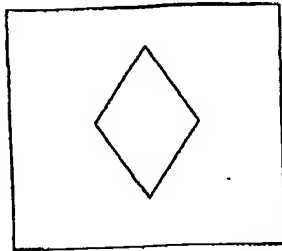


In (100)-material always pyramidal shaped structures are generated.

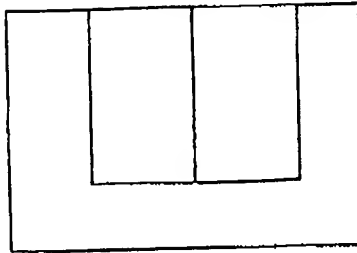
(110)-material:

Deep shafts with vertical side walls are generated in (110) material. The structures show the shape of a rhombus in a top planar view.

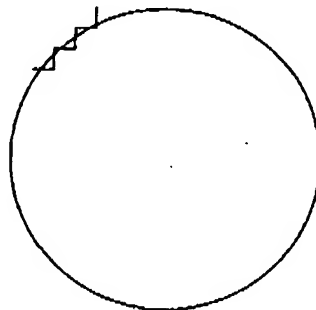
Top planar view:



Cross section:



It holds for (100) – and (110)- material that with the goal to etch a circle by wet chemistry, there is generated in reality a toothed edge:



No bent structure, no circle, no channel which is bent can be generated by wet chemistry. The delimitation on the sides shows always teeth. According to an extreme case a circular shaped structure transforms after a sufficiently long etching time in a rectangle, which is a disadvantage of the wet method. (111)-material is nearly not at all attacked by anisotropic wet etching methods, since the etch rate of the $\langle 111 \rangle$ -plane is the lowest etch rate.

A progress in the shaping of the silicon substrate was only achieved by the aniso-tropic plasma etching according to the German printed Patent DE 42 41 045 C1, however only with the vertical walls and with disregard of the crystal planes.

According to a further improvement according to the invention beveled, inclined walls and with disregard of the disadvantageous changes of crystal planes in the etching profile with a defined slope angle was only achieved in the present application method by the claimed combination of isotropic plasma etching and aniso-tropic plasma etching.

Because these inventions are independent or distinct for the reasons given above and there would be a serious burden on the examiner if restriction is not required because the inventions have acquired a separate status in the art in view of their different classification, restriction for examination purposes as indicated is proper.

Applicants are now amending claim 1 and it is believed that this will overcome the restriction requirement.

A telephone call was made to Mr. Kasper on May 21, 2007 to request an oral election to the above restriction requirement, but did not result in an election being made.

Mr. Kasper responds to all calls relating to a restriction requirement and does what he can to come to a selection to be made.

Applicant is advised that the reply to this requirement to be complete must include (i) an election of a species or invention to be examined even though the requirement be traversed (37 CFR 1.143) and (ii) identification of the claims encompassing the elected invention.

The restriction requirement is respectfully traversed.

The selected group is group II with claims 2 to 8. It is respectfully submitted that amended claim 1 and claim 9 also belong to group II.

The election of an invention or species may be made with or without traverse. To reserve a right to petition, the election must be made with traverse. If the reply does not distinctly and specifically point out supposed errors in the restriction requirement, the election shall be treated as an election without traverse.

Should applicant traverse on the ground that the inventions or species are not patentably distinct, applicant should submit evidence or identify such evidence now of

record showing the inventions or species to be obvious variants or clearly admit on the record that this is the case. In either instance, if the examiner finds one of the inventions unpatentable over the prior art, the evidence or admission may be used in a rejection under 35 U.S.C.103(a) of the other invention.

The error in the restriction requirement is that wet chemistry does not allow the etching shapes of the present invention to be made.

Applicant is reminded that upon the cancellation of claims to a non-elected invention, the inventorship must be amended in compliance with 37 CFR 1.48(b) if one or more of the currently named inventors is no longer an inventor of at least one claim remaining in the application. Any amendment of inventorship must be accompanied by a request under 37 CFR 1.48(b) and by the fee required under 37 CFR 1.17(i).

Applicants are not aware at this time to make any necessary changes in inventorship.

Reconsideration of all outstanding rejections is respectfully requested.

All claims as presently submitted are deemed to be in form for allowance and an early notice of allowance is earnestly solicited.

Respectfully submitted,
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